

ACCREDITED ISE CERTIFICATE #2764.01 NL	C LISTED, REGISTRATION IMBER: 2764.01 Test report No: ED LISTED REGISTRATION 4158ERM.007 IMBER: 23595-1
<b>Test report</b> FCC Rules and Regulations CFF ICES-003 Issue 7 (October 2020)	R 47, Part 15, Subpart B (2018) &
(*) Identification of item tested	Infotainment Head Unit
(*) Trademark	Garmin
(*) Model and /or type reference	IDC23 High 8185
Other identification of the product	HW version: AA3911 FCC ID: IPH-03911 IC: 1792A-03911
(*) Features	Bluetooth classic; BLE; Wi-Fi 2.4GHz; Wi-Fi 5GHz; GNSS
Manufacturer	GARMIN INTERNATIONAL, INC. 1200 E. 151st Street, Olathe, Kansas 66062, USA
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B (2018) ICES-003 Issue 7 (October 2020)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	10-18-2023
Report template No	FDT08_23 (*) "Data provided by the client"



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# Acronyms

Acronym ID	Acronym Description
Code	EMC Test Code
Freq Rng	Frequency Range
MP	Measurement Point
ОМ	Operation Mode
S/	Sample
V	Verdict

# Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

In order to assure traceability to other national and international laboratories, DEKRA Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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# General conditions

- 1. This report only referred to the item that has undergone the test.
- 2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
- 3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
- 4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

# Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Certification internal document PODT000.

	Frequency (MHz)	U (k=2)	Units
Radiated emission	30 - 1000	5.94	dB
	1000-18000	5.89	dB



# Data provided by the client

The following data has been provided by the client:

- 1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
- The sample consists of an Infotainment Head Unit. The main functionalities are the following: Navigation, USB, voice recognition and several interfaces to the vehicle and Bluetooth / WLAN. The Head-unit provides different interfaces like: AR-CAM input, Video-out APIX3 (for the connection of an external Display), 3 USB interfaces.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

# Usage of samples

Samples used for test have been selected by: The client.

Sample S/01 is composed of the following elements, accessories and auxiliary equipment:

ld	Control Number	Description	Manufacturer / Model	Serial Nº	Date of Reception	Application
S/01	1206	Transceiver	Messtechnik / optoCAN-FD		-	Auxiliary Element
S/01	1206.01	ST/ST Multimode Patch cord 20m 62,5/125µm	-	-	-	Auxiliary Element
S/01	1207	Transceiver	Messtechnik / optoCAN-FD	-	-	Auxiliary Element
S/01	3428/08	Ethernet Cable (1.8m)	NA / 5E	-	06/01/22	Accessory
S/01	3428/09	Ethernet Cable (1.6m)	NA / 5E	-	06/01/22	Accessory
S/01	3428/10	USB-3.0 to Gigabit Ethernet Adapter	Trendnet / TU3-ETG	RA9AU31003569	06/01/22	Accessory
S/01	3428/11	USB-3.0 to Gigabit Ethernet Adapter	Trendnet / TU3-ETG	RA0EU32000337	06/01/22	Accessory
S/01	3428/32	BMW Antenna-DA Fakra 5G-GNSS	Molex	6520 8705915-04	06/01/22	Element Under Test
S/01	3428/33	Fakra to Fakra Cable	-	-	06/01/22	Accessory
S/01	3428/34	AR-CAM Shied Box	Garmin	-	06/01/22	Accessory
S/01	3428/35	Fakra to Fakra Cable	-	-	06/01/22	Accessory
S/01	3428/36	Fakra Z to BNC Pigtail Cable coaxial	-	-	06/01/22	Accessory
S/01	3428/37	CAN/LIN Interface	Remus / VN1630A	007113-042714	06/01/22	Accessory
S/01	3428/39	CAN Connector (DB9) - Cable	-	-	06/01/22	Accessory
S/01	3428/40	WLAN/Bluetooth Antenna with Fakra SF connector	MD Elektronik / λ/4 coax cable antenna BMW 9.289.029.3	-	06/01/22	Element Under Test
S/01	3428/42	USB to Fakra cable	-	-	06/01/22	Accessory
S/01	3428/43	USB to Fakra cable	-	-	06/01/22	Accessory
S/01	3428/45	USB device 32GB	Samnsung / MUF-32BE		06/01/22	Accessory
S/01	3428/46	USB device 32GB	Samnsung / MUF-32BE		06/01/22	Accessory



ld	Control Number	Description	Manufacturer / Model	Serial №	Date of Reception	Application
S/01	3428/48	FSMA to FSMA Cable for 1G base-T	-	-	06/01/22	Accessory
S/01	3428/59	Laptop 1	DELL / Latitude 7490	8129802566	06/01/22	Accessory
S/01	3428/60	Laptop 2	DELL / Latitude 7490	42700169594	06/01/22	Accessory
S/01	3582/05	DCS Camera Load	Garmin	-	02/08/22	Accessory
S/01	3582/09	DCS Cable	Garmin	-	02/08/22	Accessory
S/01	3967/05	Transceiver	Messtechnik / optoLAN-Gb	21-023262	06/09/23	Accessory
S/01	3967/06	Transceiver	Messtechnik / optoLAN-Gb 88Q2112	21-023071	06/09/23	Accessory
S/01	3967/09	Transceiver	Messtechnik / optoLAN-Gb BCM89811	20-022952	06/09/23	Accessory
S/01	3967/10	Transceiver	Messtechnik / optoLAN-100- MAX	21-023300	06/09/23	Accessory
S/01	3967/17	ST/ST Multimode Patch cord 20m 62,5/125µm	-	-	06/09/23	Accessory
S/01	3967/18	ST/ST Multimode Patch cord 20m 62,5/125µm	-	-	06/09/23	Accessory
S/01	3967/27	DFE test box	Garmin	-	06/09/23	Accessory
S/01	3967/28	HUD test box	Garmin	-	06/09/23	Accessory
S/01	3967/29	CID test box	Garmin	-	06/09/23	Accessory
S/01	3967/30	Load cable (black/red)	Garmin	-	06/09/23	Accessory
S/01	3967/31	HUD cable	Garmin	-	06/09/23	Accessory
S/01	3967/32	DFE cable	Garmin	-	06/09/23	Accessory
S/01	3967/33	CID cable	Garmin	-	06/09/23	Accessory
S/01	3967/38	Transceiver	Messtechnik / optoCAN-FD	20-022784	07/05/23	Accessory
S/01	3967/39	Transceiver	Messtechnik / optoCAN-FD	20-022803	07/05/23	Accessory
S/01	3967/42	CAN Connector (DB9) - Cable	-	-	07/05/23	Accessory
S/01	3967/43	Harness	Garmin	-	07/05/23	Element Under Test
S/01	3967/44	PCAN-USB Adapter	Phytools / PEAK-System Technik		07/05/23	Accessory
S/01	3967/45	ST/ST Multimode Patch cord 20m 62,5/125µm	-	-	07/05/23	Accessory
S/01	3967/47	Intel NUC Mini PC	Intel / NUC10FNK	G6FN145000Z6	07/05/23	Accessory
S/01	4158/04	Infotainment Head Unit	Garmin / IDC23 High 8185	GAB429P0001663	05/30/23	Element Under Test

Notes referenced to samples during the project:

ld	Туре	Note
S/01	Commercial	Sample S/01 was used for all test(s) indicated in appendix A.



# Test sample description

Test Sample description (compulsory information for EMC and RF testing services

Ports:		Cable						
	Port n	ame and description	Specified length [m]	Attached during test	I Shielde	d Coupled to patient		
	BT/W	i-Fi Antenna	2					
	USB <sup>2</sup>	1/2	2					
	Powe	r	2					
	CID		2					
	AR-Ca	am	2					
	100 B	ase T1	2	$\square$				
	1G Ba	ase T1	2	$\square$				
	GPS		2	$\square$				
	DCS		2					
	HUD		2					
	DFE		2					
Supplementary information to the ports:	No Da	ata Provided						
Rated power supply:				Reference poles				
	Voltaç	Voltage and Frequency		L2	L3 N	I PE		
		AC:						
		AC:						
		DC:						
Rated Power		ata Provided						
Clock frequencies:	No Da	ata Provided						
Other parameters:	No Da	ata Provided						
Software version:	_	ata Provided						
Hardware version	No Da	ata Provided						
Dimensions in cm (W x H x D):	No Da	ata Provided						
Mounting position	Table top equipment							
		Wall/Ceiling mounted equipment						
		Floor standing equipm						
		Hand-held equipment						
		Other: Automotive						
Modules/parts:		le/parts of test item		Туре Ма				
		ata Provided						
Accessories (not part of the test item)	Descr		Туре		N	anufacturer		
		ata Provided						



Documents as provided by the applicant	Description	File name	Issue date
	Declaration Equipment Data	FDT30_18 Declaration Equipment Data_IDC23 High 8185 signed	August 23, 2023
	Copy of marking	plate:	
産品名稱: Manufactu 住明GA Model /型 Made in /? Input / 輸/ FCC ID: IF ■Dolby AUBIO THIS DEVICE CO LICENSE-DXRM TWO THAT BARC (1) THAS DEVICE (2) THIS DEVICE CO LICENSE-DXRM TWO THAT BARC (2) THIS DEVICE (2) THIS DEVICE (3) THIS DEVICE (3) THIS DEVICE (4) THIS	Recondense     Recondense		
ZXXXXXXX GAFMIN (Europe Liberty House Houradown Busi Southampton, S	BEETHOVENSTRASSE IA	XX AA	

# Identification of the client

Garmin International, Inc. 1200 E. 151st Street, Olathe, Kansas 66062, USA

# Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	2023-07-24
Date (finish)	2023-07-27

# **Document history**

Report number	Date	Description
4158ERM.007	10-18-2023	First release



# Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

### Remarks and comments

- 1. The tests were performed by the technical personnel: Qi Zhang, Yuri Barone, Koji Nishimoto, and Victor Albrecht.
- 2. The external connections are:
  - BT/WLAN antenna connection (3 antennas, 1 pin unused)
  - USB2/3 for USB 2.0 connections
  - Main power and CAN
  - CID APIX2 and APIX3 display link (HDCP2.3)
  - AR-CAM camera
  - 100BASE-T1 (OABR) ethernet
  - 1GBASE-T1 1GBit ethernet
  - GNSS GNSS antenna connection
  - DCS driver camera system
  - DFE design front end (instrument panel displays)
  - HUD head up display



# **Testing verdicts**

Fail	F
Inconclusive	1
Not applicable	N/A
Not measured	N/M
Pass	Р
Partial Passed	P*

# Summary

Test Specification	Requirement – Test case	Verdict	Remark		
FCC CFR 47, Part 15, Subpart B(2018) &	Continuous conducted emission on Power leads - Unintentional radiators	N/A	(1), (2)		
ICES-003 Issue 7 (October 2020)	Radiated emission electromagnetic field – Unintentional radiators	Р	-		
Supplementary information and remarks:					

(1) According with the requirements of FCC Rules and Regulations, title 47, Chapter I, Subchapter A, Part 15, Subpart B, §15.107 Conducted limits, (d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation, and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

(2) Exemptions from the scope of ICES-003, clause 1.5.1 ICES-003 does not apply to the following types of equipment (a) ITE or digital apparatus factory-installed in vehicles, boats or devices equipped with internal combustion engines, traction batteries or both (subject to ICES-002). ITE or digital apparatus not factory-installed in vehicles, boats or devices equipped with internal combustion engines, traction batteries or both do not qualify for this exemption.

# List of equipment used during the test

#### FCC 47 CFR Part 15B

#### Test Equipment's for RE

Control Num	Equipment	Manufacturer	Serial	Model	Next calibration
1012	ESR26 Emi Test Receiver	Rohde & Schwarz	101478	ESR26	2025-03-10
1014	FSV40 Signal Analyzer 40GHz	Rohde & Schwarz	101626	FSV40	2024-08-01
1056	3116C Double-Ridged Waveguide Horn Antenna (18-40GHz)	ETS Lindgren	213179	3116C	2026-02-23
1058	3115 Double-Ridged Waveguide Horn Antenna (750 MHz-18 GHz)	ETS Lindgren	211373	3115	2026-06-26
1064	3142E Biconilog Antenna	ETS Lindgren	208600	3142E	2024-12-12
1108	Ethernet SNMP Thermometer	HW GROUP	60038026954	HWg-STE Plain	2024-10-18
1111	Ethernet SNMP Thermometer	HW GROUP	60038026577	HWg-STE Plain	2024-10-18
1314	Wireless measurement soft. EMC 32	Rohde & Schwarz	1040OT102236		
1461	Low Noise Preamplifier (1-18GHz)	Bonn Elektronik	2213857B	BLMA0118-4A	2024-06-01
1462	Low Noise Preamplifier (18-40GHz)	Bonn Elektronik	22138557C	BLMA1840-4G	2024-06-01



# Appendix A: Test results



# Appendix A content

DESCRIPTION OF THE OPERATION MODES	13
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Radiated emission electromagnetic field – Unintentional radiators	



# Description of the operation modes

The operation modes described in this paragraph constitute a functionality of the sample under test for itself.

The operation modes used by the samples to which the present report refers, are shown in the following table:

ld	Description
OM/0	
	Display, HUD, AR-CAM, and DCS Camera Loaded. Power supply 12 Vdc.

# Test standards version applied

The product standards and test standards applied for each test cases are shown in the following table:

Product Test Standard	Test standard	Requirement – Test case	
FCC CFR 47, Part 15, Subpart B (2018) &	ANSI C63.4 (2014)	Continuous conducted emission on Power leads - Unintentional radiators	
ICES-003 Issue 7 (October 2020)	ANSI C63.4 (2014)	Radiated emission electromagnetic field - Unintentional radiators	

# Test Conditions

#### RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30-1000 MHz (Bilog antenna) and 1-18 GHz (Double ridge horn antenna) and at a distance of 1m for the frequency range 18-40 GHz (18-40 GHz Double ridge horn antenna).

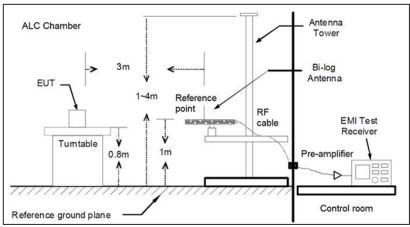
For radiated emissions in the range 18-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

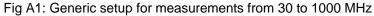
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.







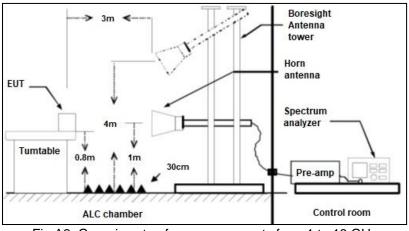


Fig A2: Generic setup for measurements from 1 to 18 GHz

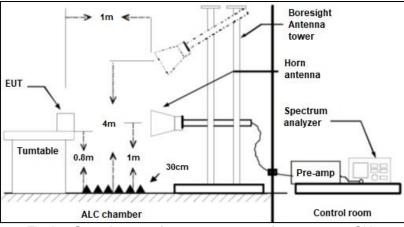


Fig A3: Generic setup for measurements from 18 to 40 GHz



# **Test Cases Details**

#### FCC 47 CFR Part 15B

#### Radiated emission electromagnetic field – Unintentional radiators

#### Limits

<u>Limits of interference Class B</u> The applied limit for radiated emissions, according to the requirements of:

- FCC Rules and Regulations 47 CFR Part 15, Subpart B, Secs. 15.109 (a): [54 FR 17714, Apr. 25, 1989, as amended at 56 FR 373, Jan. 4, 1991; 58 FR 51249, Oct. 1, 1993; 66 FR 19098, Apr. 13, 2001; 67 FR 48993, July 29, 2002; 69 FR 2849, Jan. 21, 2004; 80 FR 33447, June 12, 2015].
- ICES-003 Issue 7, Secs 3.2.2, table 2 & 4 (October 2020).

	FCC F	FCC Part 15B ICES-003 Issue 7		03 Issue 7 FCC Part 15B & ICES-003 Issue 7		ICES-003 Issue 7
Frequency range	QP Limit for 3 m		QP Limit for 3 m QP Limit for 3 m		PK Limit for 3 m	AVG Limit for 3 m
(MHz)	(μV/m)	(dBµV/m)	(µV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)
30 to 88	100	40	100	40		
88 to 216	150	43.5	150	43.5		
216 to 230	200	46	200	46		
230 to 960	200	46	224	47		
960 to 1000	500	54	500	54		
Above 1000					74	54

Limits according to FCC Part 15B, are equal or more stringent than those of ICES-003 Issue 7.

#### Code: REmmnnRR

- RE: Radiated Emission,
- mm: Sample number,
- nn: Operation mode,
- **RR: Frequency range** Low Range = LR: [30, 1000];

High Range = HR1: [1000, 18000] HR2: [18000, 40000]

#### **Results**

S/	ОМ	Code	Freq Rng (MHz)	V
01	OM/01	RE0101LR	[30, 1000]	Р
01	OM/01	RE0101HR1	[1000, 18000]	Р
01	OM/01	RE0101HR2	[18000, 40000]	Р

#### Verdict

Pass



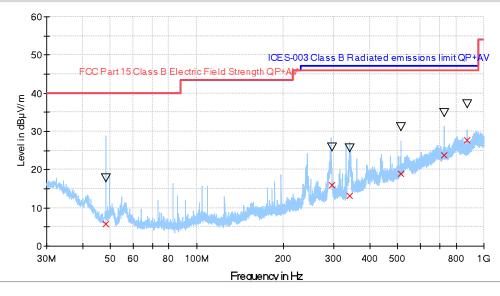
#### Attachments

EMC Test Code = RE0101LR Frequency Range MHz = [30, 1000]

#### Sample ID: S/01

Operation Mode: OM/01. DUT ON. BT, Wi-Fi, and USB in Stand-by mode. GPS in RX mode. Ethernet carries some traffic. Display, HUD, AR-CAM, and DCS Camera Loaded. Power supply 12 Vdc.

#### Images:



ICES-003 Class B Radiated emissions limit QP+AV Preview Result 1-PK+ FCC Part 15 Class B Electric Field Strength QP+AV X Final\_Result QPK ▼ Final\_Result PK+

#### Tables:

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
48.189000	5.78	17.76	40.00	34.22	V
294.709000	16.02	25.92	46.00	29.98	Н
339.537000	13.16	25.69	46.00	32.84	V
512.782500	18.81	31.21	46.00	27.19	Н
725.998000	23.68	34.78	46.00	22.32	Н
874.975500	27.58	37.07	46.00	18.42	Н

#### **Spectrum Analyzer Parameters**

Subrange	Step Size	Detectors	Bandwidth	Sweep Time
30 MHz - 1 GHz	48.5 kHz	PK+	100 kHz	1 s

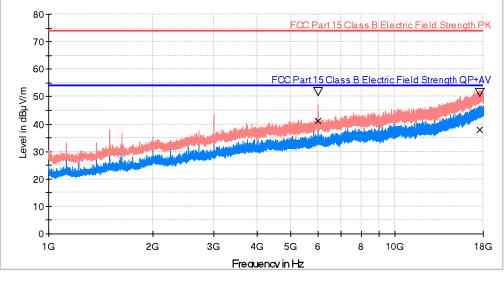


#### EMC Test Code = RE0101HR1 Frequency Range MHz = [1000, 18000]

#### Sample ID: S/01

Operation Mode: OM/01. DUT ON. BT, Wi-Fi, and USB in Stand-by mode. GPS in RX mode. Ethernet carries some traffic. Display, HUD, AR-CAM, and DCS Camera Loaded. Power supply 12 Vdc.

#### Images:



Preview Result 2-AVG
 Preview Result 1-PK+
 FCC Part 15 Class B Electric Field Strength PK
 FCC Part 15 Class B Electric Field Strength QP+AV
 ∇ Fina LResult PK+
 × Fina LResult AVG

#### Tables:

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/	Margin (dB)	Pol
6000.00000	51.62		73.90	22.28	V
6000.100000		41.02	53.90	12.88	Н
17578.600000	51.40		73.90	22.50	Н
17582.000000		38.05	53.90	15.85	V

#### **Spectrum Analyzer Parameters**

Subrange	Step Size	Detectors	Bandwidth	Sweep Time
1 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s

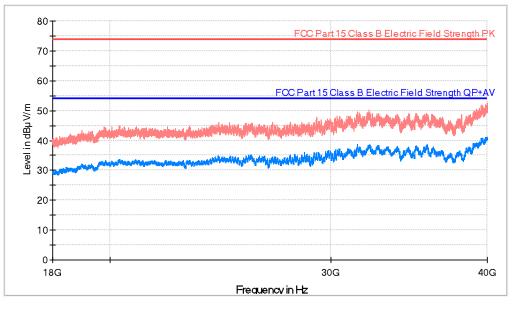


#### EMC Test Code = RE0101HR2 Frequency Range MHz = [18000, 40000]

#### Sample ID: S/01

Operation Mode: OM/01. DUT ON. BT, Wi-Fi, and USB in Stand-by mode. GPS in RX mode. Ethernet carries some traffic. Display, HUD, AR-CAM, and DCS Camera Loaded. Power supply 12 Vdc.

#### Images:



- AVG\_MAXH

PK+\_MAXH

- FCC Part 15 Class B Electric Field Strength PK

FCC Part 15 Class B Electric Field Strength QP+AV

#### Tables:

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
24419.600000	43.8	35.0	V	18.9	53.9
32235.100000	47.6	38.6	V	15.3	53.9
40000.000000	50.3	41.3	V	12.6	53.9

### **Spectrum Analyzer Parameters**

Subrange	Step Size	Detectors	Bandwidth	Sweep Time
18 GHz - 40 GHz	687 kHz	PK+ ; AVG	1 MHz	1 s